

BASEBAND WIRELESS NETWORK FOR ISOCRONOUS COMMUNICATION

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] This invention pertains generally to network systems for exchanging data across a shared medium. More particularly, the invention is a wireless communication network system for isochronous data transfer between node devices of the network system that provides at least one master node device which manages the data transmission between slave node devices of the network system, and which further provides a time division multiple access frame definition which provides each node device on the network system a transmit time slot for communication.

[0003] 2. The Prior Art

[0004] Network systems for data communication exchange have been evolving for the past several decades. Particularly, computer network systems have been developed to exchange information and provide resource sharing. Network systems generally comprise one or more node devices which are interconnected and capable of communicating. The most common network systems today are "wired" local area networks (LANs) and wide area networks (WANs). Normally, node devices participating in such wired networks are physically connected to each other by a variety of transmission medium cabling schemes including twisted pair, coaxial cable, fiber optics and telephone systems including time division switches (T-1, T-3), integrated services digital network (ISDN), and asymmetric digital subscriber line (ADSL). While wired solutions provide adequate bandwidth or data throughput between node devices on the network, users participating in such networks are generally restricted from mobility. Typically, users participating in a wired network are physically limited to a specific proximity by the length of the cable attached to the user's node device.

[0005] Many common network protocols in use today are asynchronous and packet based. One of the most popular is Ethernet or IEEE 802.3. These types of networks are optimized for bursts of packetized information with dynamic bandwidth requirements settled on-demand. This type of network works well for many data intensive applications in computer networks but is not ideal for situations requiring consistent delivery of time-critical data such as media streams.

[0006] Media streams typically require connection oriented real-time traffic. Most media stream applications need to establish a required level of service. Dedicated connections are required with a predictable throughput. Low traffic jitter is often a necessity and can be provided with the use of a common network clocking reference.

[0007] Firewire, or IEEE 1394, is an emerging wireline network technology that is essentially asynchronous, but provides for isochronous transfers or "sub-actions". Isochronous data is given priority, but consistent time intervals of data transfer is limited by mixing isochronous and purely asynchronous transfers.

[0008] Universal Serial Bus (USB) is a popular standard for computer peripheral connections. USB supports isoch-

ronous data transfer between a computer and peripheral devices. The computer serves as bus master and keeps the common clock reference. All transfers on USB must either originate or terminate at the bus master, so direct transfers between two peripheral devices is not supported.

[0009] Wireless transmission provides mobile users the ability to connect to other network devices without requiring a physical link or wire. Wireless transmission technology provides data communication through the propagation of electromagnetic waves through free space. Various frequency segments of the electromagnetic spectrum are used for such transmission including the radio spectrum, the microwave spectrum, the infrared spectrum and the visible light spectrum. Unlike wired transmission, which is guided and contained within the physical medium of a cable or line, wireless transmission is unguided, and propagates freely through air. Thus the transport medium air in wireless communication is always shared between various other wireless users. As wireless products become more pervasive, the availability of airspace for data communication becomes proportionally more limited.

[0010] Radio waves travel long distances and penetrate solid objects and are thus useful for indoor and outdoor communication. Because radio waves travel long distances, radio interference between multiple devices is a common problem, thus multiple access protocols are required among radio devices communicating using a single channel. Another common problem associated with wireless transmission is multi-path fading. Multipath fading is caused by divergence of signals in space. Some waves may be refracted off low-lying atmospheric layers or reflected off objects such as buildings and mountains, or indoors off objects such as walls and furniture and may take slightly longer to arrive than direct waves. The delayed waves may arrive out of phase with the direct waves and thus strongly attenuate or cancel the signal. As a result of multipath fading, operators have resorted to keeping a percentage of their channels idle as spares when multipath fading wipes out some frequency band temporarily.

[0011] Infrared communication is widely used for short-range communication. The remote controls used on televisions, VCRs, and stereos all use infrared communication. The major disadvantage to infrared waves is that they do not pass through solid objects, thus limiting communication between devices to "line of sight". These drawbacks associated with the current implementation of wireless technology in network systems have resulted in mediocre performance and periodic disruption of operations.

[0012] In addition to the above noted drawbacks of Firewire and USB, there are currently no standards for wireless implementations of either. Of the wireless networks in use today, many are based at least in part on the IEEE 802.11 (wireless ethernet) extension to IEEE 802.3. Like wireless ethernet, this system is random access, using a carrier sense multiple access with collision detect (CSMA-CD) scheme for allowing multiple transmitters to use the same channel. This implementation suffers from the same drawback of wireline ethernet described above.

[0013] A similar implementation intended for industrial use is that of Hyperlan™. While still an asynchronous protocol, Hyperlan™ uses priority information to give streaming media packets higher access to the random access